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A MAGAZINE FOR DENTISTS, DENTAL ASSISTANTS, AND DENTAL HYGIENISTS

April 1956 Vol. XV No. 4

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The Constant Plane of Occlusion

A working hypothesis for its recapture in the edentulous state when disease has destroyed the normal conditions

by Frank H. McKevitt, D.D.S.

The constant plane of occlusion will be considered here from the standpoint of a working hypothesis. No one has hitherto treated the subject from that point of view. Yet from this point it presents itself to us as a live issue, in fact the most important of present prosthodontic issues. This may serve to indicate the character of evidence with which we must deal in considering the problem which involves the culmination of slow metamorphosis or development of alveolar bone from the sixth year of life to old age.

During the sixth year the normal elevation of the plane of occlusion and the normal height of the interalveolar crestline space is established by the eruption of the mandibular and maxillary first molar teeth and are completed during the next twelve years by the staggered eruption of the complete dentition.

The occlusal plane sometimes described as the curve of Spee can be readily envisaged in the normal state. When disease processes have altered its normal status, its position as an invisible, though actual geometric entity or plane remains unchanged despite vagaries of its formative agents, the occlusal surfaces of the teeth that have undergone a slow movement which has forced them into odd manners of angular inclinations.

Factors that have contributed to this slow development are atrophies, staggered extractions, drifting teeth, abrasions, and exfoliating teeth. As a corollary, an imbalance usually results and affects the reciprocal dependence of the occlusal plane, the height of the "bite" or the interalveolar crest line space, and the temporomandibular articulation which depend one upon the other for equilibrium. Such deviations from the normal plane of occlusion result in increased and diminishing heights of the vertical dimension of the interalveolar crest line space. Atrophic changes mark the *increases* and staggered extractions accent *decreases* in the space height; variations that signify nature's delight in antitheses.

FIG. 1. A roentgenologic study of alveolar bone. The height of the interalveolar crest line space is increasing. Atrophic changes are moving the ridgecrests in opposite directions from the constant plane of occlusion while the teeth are present.

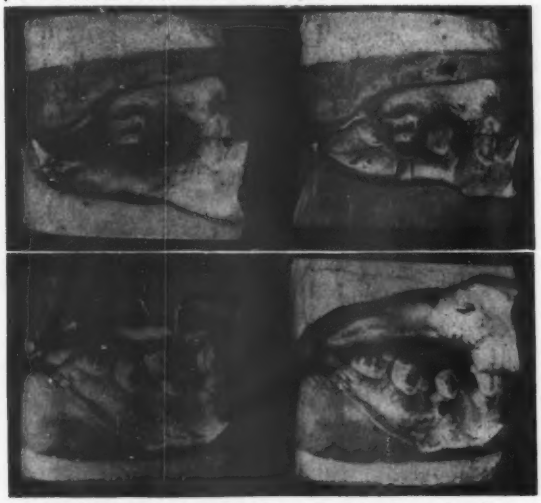


FIG. 2. Staggered extractions disrupt the integrity of the plane of occlusion. Effects of this kind taking place before our eyes require a considerable lapse of time to produce a distinctly marked encroachment on the occlusal plane from opposite directions.
This extant dimension must be recaptured with accuracy. The casts on the reader's left indicate the condition before; those on the right, conditions following surgery.

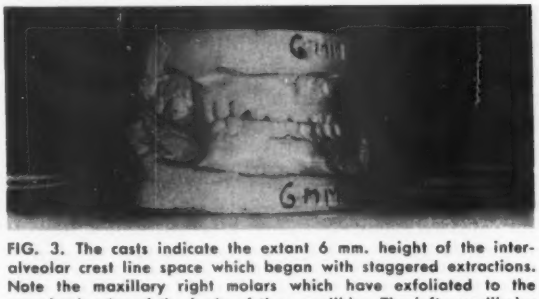


FIG. 3. The casts indicate the extant 6 mm. height of the interalveolar crest line space which began with staggered extractions. Note the maxillary right molars which have exfoliated to the superior border of the body of the mandible. The left mandibular third molar has extruded to the maxillary ridgecrest, abrasions are corollary. Both processes must be alveolectomized to compensate the thickness of base plate material and ridgelaps of artificial teeth if the extant height of the vertical dimension is to be retained. The recapture of the extant interalveolar crest line space is indicated; any increase in its length is contraindicated.

In this presentation, measured deviations from the norm will be described as extant. As such they must be recaptured accurately at the chair with compound occlusal bite rims rather than with fickle wax. Deviating lateral path movements also follow atrophic changes and staggered extractions, and are manifest in the horizontal plane of occlusion by Gothic arch tracings; the normal angles of which register 60° to the right and left. Abnormal deviations vary from 90° to 34° on the right and left and vice versa.

Variations from the normal Gothic arch tracing should indicate to the discerning operator imbalances in the temporomandibular articulation, the plane of occlusion, and the height of the interalveolar crest line space, which depend on each other for balance. The structural integrity and the clarity of the prosthodontic plan are basic. They should imply a knowledge of the various stages of the work from its beginning to its completion. The *initial* and *second* steps involve roentgenologic and study cast interpretations that reveal atrophy and hypertrophy of the alveolar processes which at times require surgical intervention before an impression is taken.

Surgery when it is indicated thus becomes the *third* step in an orderly prosthodontic procedure. The surgical preparation of the alveolar ridges for the reception of artificial dentures warrants discussion under a separate caption. At this point it should be apparent that impression-taking which is usually regarded as the initial step in prosthodontic procedure is actually the *fourth* of a series. The *fifth* step or link in the prosthodontic chain is the reestablishment of the correct extant elevation of the plane of occlusion and the correct extant vertical dimension of the interalveolar crest line space, which combines to form with it an integrated balancing unit with the temporomandibular articulation. The elevation of the plane must be reestablished with care in advance of the measured height of the interalveolar crest line dimension.

To accomplish this properly we must clearly visualize the engineering requirements involving the transition from the natural to the arbitrary artificial order. A clear concept should be had of the limitations imposed by its arbitrary recovery.

The natural undulating anteroposterior curve and its coordinal transverse curve of Spee must be reduced to a flattened plane. As a working hypothesis, the plane of occlusion must be envisaged as constant and deviations toward and away from it must be considered extant. Extant variations from the normal plane of occlusion can be visualized roentgenologically (Fig. 1), and in casts of the jaws (Figs. 2, 3). The accurate recapture of these dimensions is mandatory. Surgical preparation of the ridges for the reception of artificial dentures is implied.

Denture Cases Classified

Full artificial denture cases will be described under four separate categories:

Patients about to lose their maxillary teeth only.

Patients about to become fully edentulous.

Fully edentulous patients presenting for renewal of older dentures.

Fully edentulous patients presenting without dentures, pre-extraction casts or any record of the height of the interalveolar crestline space.

Maxillary full dentures in the *first* category. In this category pre-extraction casts are mandatory. They should reveal details of the anterior papilla of the maxillary rugae and, when present, the cervices of the teeth in the median line and ridge crests of the maxillae and mandible. Fig. 4 shows occluded casts of a case in this category with the absence of the maxillary central incisor and lateral teeth. The maxillary papilla and the median line of the mandibular ridge crest are in plain view, which prompts the suggestion that in research it is axiomatic that simplicity is the keynote when in search of the obvious. These two points are spanned with dividers and the vertical dimension of 11 mm., is recorded on the cast.

The elevation of the occlusal plane is fixed by the occlusal surfaces of the mandibular teeth. The objective is the recapture of it and the height of the interalveolar crest line dimension (Fig. 4) at which time the inter-occlusal or so-called free space will be restored automatically. This is done at the chair by placing a heated maxillary compound bite rim (Fig. 5) in the mouth and having the patient close to the 11 mm. dimension recorded on the control cast (Fig. 4). Fig. 6 illustrates the case mounted on the articulator and the measured vertical dimension of the interalveolar crest line taken from the papilla as a point of beginning to the median line of the mandibular ridge crest as its terminus.

Second Category

In the second category all maxillary and mandibular teeth are to be removed and replaced artificially. Detailed pre-extraction casts are mandatory as they contain a record of the size, order, and alignment of the maxillary incisors (when present). The most significant items contained are records of the extant elevation of the occlusal plane and also the vertical dimension of the extant height of the interalveolar crest line space.

Technically the gauging of the extant plane of occlusion and the extant height of the interalveolar ridgecrest space does not differ fundamentally from one category to another. For obvious reasons, the tragus ala line cannot be used in the first category or in cases where the six anterior mandibular teeth are to be retained. Its limited use is mandatory when

FIG. 4. Casts in first category of full denture cases. The compass points span the distance between the elevation of the maxillary papilla and the ridgecrest in the medial line of the mandible. The number 8 denotes the elevation of the occlusal plane; the number 11 the extant height in millimeters of the interalveolar crestline space.

FIG. 5. The mandibular cast and the maxillary occlusion rim indicate the method of recapturing the extant height of the vertical dimension, which has been calibrated at 11 mm. The elevation of the occlusal plane is 8 mm.

FIG. 6. Shows recapture of correct plane of occlusion and correct height of the interalveolar space without maxillary occlusion rim (shown in Fig. 5). The elevation of the occlusal plane is 8 mm. The combined height of the interalveolar space is 11 mm.

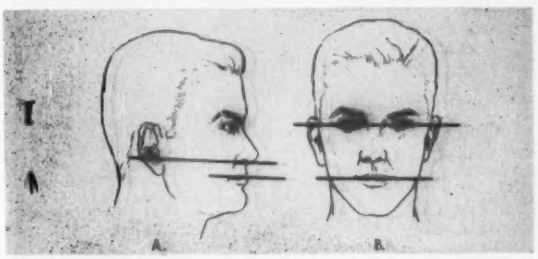


FIG. 7. The establishment of the arbitrary maxillary occlusal plane is governed by the tragus ala line drawn on the face, from the upper border of the external auditory meatus to the ala of the nose, and laterally by an imaginary line drawn through the pupils cervex to incisal edge, which is marked on the maxillary occlusal of the eyes. The height of the maxillary occlusal plane is determined from the length of the maxillary central incisor, measured from rim, and paralleled with the tragus ala line.

FIG. 8. The occlusal plane, using compound occlusal rims, is recaptured from the length of the maxillary central incisor, indicated on the outside caliper at 11 mm. and the diagonal white line, drawn from the fossa formed in the base plate by the papilla, to the incisal edge of the maxillary occlusal rim. The pattern forms a right-angled triangle, the hypotenuse of which is longer than its perpendicular. It indicates the length and position of the maxillary central incisor in situ.

FIG. 9. Shows the total height of the interalveolar space on the outside caliper, 17 mm., and the manner of its recapture.

FIG. 10. Numbers on the casts (11/17) denote the elevation of occlusal plane and height of interalveolar space. The occlusal rims have been sectioned sagittally to show on the mounted casts following recapture of the two dimensions.

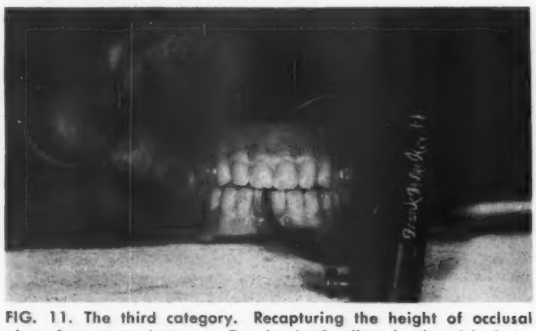


FIG. 11. The third category. Recapturing the height of occlusal plane from worn dentures. One beak of caliper is placed in fossa formed by the papilla in the maxillary denture; the other at incisal edge of maxillary central incisor which is recorded at 15 mm. on the caliper. This line should be regarded as the hypotenuse of a triangle (as Fig. 8).

complete dentures are to be restored artificially and equilibrium is the desideratum.

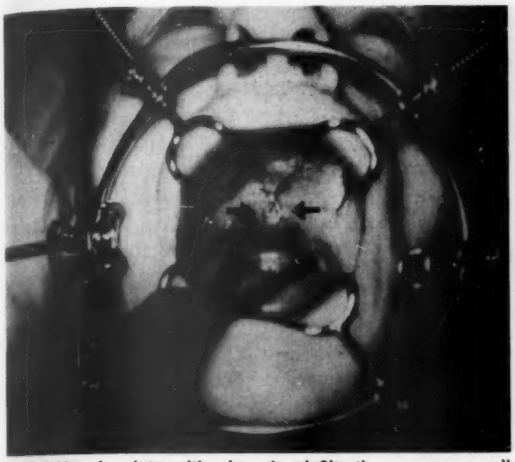
A soft pencil line is drawn on the face from the lower border of the external auditory meatus to the ala of the nose (Fig. 7). The maxillary compound occlusal rim is heated and shaped to the desired facial contour. The extant length of the maxillary central incisor is taken in millimeters from the cast from cervix to incisal edge and transferred to the maxillary occlusal rim by placing the upper beak of the outside caliper within the fossa which has been formed by the papilla of the maxillary cast. (Fig. 8). The other beak, set to correspond with the length of the incisor, is placed on the labial surface of the occlusal rim in the median line and its location marked. The occlusion rim is reheated and with the mark as a target is paralleled anteroposteriorly with the tragus ala line on the face, thence laterally with an imaginary line drawn through the pupils of the eyes. The occlusal surface of the rim is then carefully equalized on a glass slab and notched laterally and in the median line for the reception of its mandibular component, which is heated and brought to the predetermined height of the interalveolar crest line dimension taken from the casts used as controls (Figs. 9, 10).

When the rims are mounted on the articulator, the mandibular central incisors are set to the maxillary occlusal plane to conform with engineering principles that will insure stability of the movable bases in closing in the incisal bite balancing position and lateral movements of the mandible.

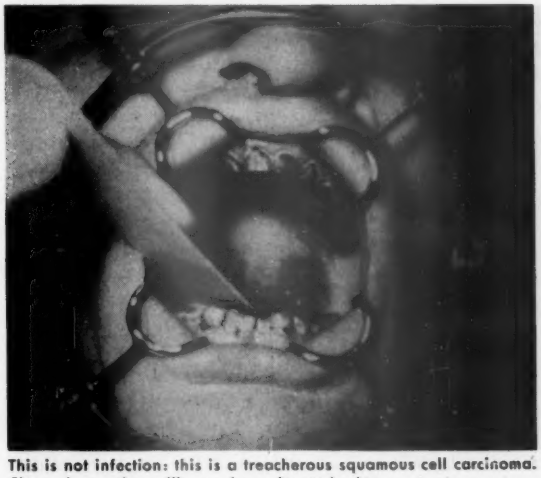
Edentulous Cases, Third Category

Edentulous cases in the third category are usually present for renewal of old dentures. The temptation to increase the height of the interalveolar crest line dimension for cosmetic effect is irresistible. The better judgment of the operator should prevail as the period of time the dentures had been used and the condition of the temporomandibular articulation should be considered. Muscle tone and atrophic changes have fixed an acquired habitual closing point to conform with the articulation of the condyles with their meniscuses. Increasing the height of the extant space is hazardous. Its accurate recapture is indicated. Deviations from this stand depend upon the condition of the edentulous ridges and the need of surgical intervention when and where required. In cases of thin and high sharp ridges that have been reduced it is plain the extant height of the space has been increased. The technical procedure in these cases is to section both older dentures in the median line to expose the papilla and the mandibular ridgecrest in the median line when the den-

(*Continued on Page Twelve*)



Leukoplakia of palate with ulcerative infiltrating squamous cell carcinoma



This is not infection: this is a treacherous squamous cell carcinoma. Close observation will reveal an elevated edge.

ORAL CANCER

by Joseph Murray, D.D.S.

PART 4

Etiology of Mouth Cancer

Although the fundamental cause of cancer in any part of the body has never been established, it is believed that chronic irritation, tobacco, avitaminosis, syphilis, some dental disorders, and ill-fitting dentures are stimulating or predisposing factors.

It is common knowledge that outdoor workers, like farmers, sailors, and lumbermen, show a high incidence of skin and lip cancer because of prolonged exposure to the sun. However, the time and duration of the irritation in addition to the patient's susceptibility are the important considerations.

Some clinicians feel that individuals with a fair or ruddy complexion are more susceptible. Others are of the opinion that a protruding lower lip offers less protection from the actinic or solar rays, predisposing that member to carcinoma.

Physicians, dentists, and X-ray technicians who carelessly expose themselves to roentgen rays and radium and ultraviolet rays often discover that they are suffering from malignancy. Other carcinogenic agents—known as chemical carcinogens—include arsenic, pitch, tar, crude paraffin, petroleum oils, and aniline dye compounds.

Several years ago some female factory workers developed osteonecrosis of the jaw and leukemia because they painted luminous watch dials with brushes that were pointed with their lips.

What role does tobacco play as a causative agent in the production of cancer? A recent study by Doctors E. C. Hammond and Daniel Horn of the American Cancer Society indicated that regular cigarette smokers had a higher death rate from cancer of sites other than the lung, than did men who never smoked. And Doctor Alton Ochnsner of New Orleans predicted that one of every ten male cigarette smokers will have cancer by 1970.

Other authorities are of the opinion that in certain individuals smoking leads to the development of leukoplakia, which at times undergoes malignant change.

In former years, the heat generated by the clay pipe was believed to contribute to mouth cancer. The modern pipe smoker, however, appears to have adequate insulation against thermal irritation.

Frequent burns and concentrated doses of tobacco tars are the apparent cause of oral malignancy in certain Indian tribes who smoke cigars with the lighted end in the mouth. Also, in some parts of the Orient and the Philippines, the betel nut-tobacco chewing native often develops a malignant neoplasm in the buccogingival sulcus where the "cud" is kept, especially if he lives on an inadequate diet.

In most cases of mouth cancer, however, evidence of more than one form of chronic irritation can be found. Therefore, it is erroneous to ascribe the lesion in any given case to tobacco alone simply because the

person smokes. Further investigation often proves that the patient also has syphilis or suffers from nutritional deficiency (avitaminosis).

Various nutritional deficiencies, avitaminosis B complex in particular, appear to have some bearing on the incidence of oral cancer. The symptoms of vitamin B deficiency are many and varied, but among the more prominent is chronic inflammation of the oral mucous membranes.

In Sweden a highly precancerous condition known as Plummer-Vinson's disease—characterized by anemia, difficulty in swallowing and atrophy of the mucous membrane of the mouth and the pharynx —often affects women and predisposes them to mouth cancer from which they are usually immune. In this category may be included workers in the "lower" socio-economic group who may be living on substandard diets or who may be lacking in cancer-detection education. At any rate, oral and skin malignancy mortality in general was twice as high in the unskilled as in the professional workers in 1944, according to Doctor M. L. Levin.

A frequent source of chronic irritation within the mouth is luetic glossitis. Before the advent of the antibiotics, about 20 percent of all male patients with cancer of the tongue had chronic syphilis, as contrasted with about 4 percent of lues in males of similar age groups without cancer of the tongue. Chronic glossitis and stomatitis may also be due to a lack of vitamin B.

Syphilis also appears to be a factor in some cases of cancer of the lip, the floor of the mouth, and the buccal surface. However, malignancy of the gingivae, the hard and soft palates, the tonsil, and the pharynx seems to be unrelated to lues.

When oral cancer and syphilis are found to be associated, the significant factor is the long-standing irritation. Cure of the luetic infection will not eliminate the cancerous lesion.

Of special significance in mouth cancer is the presence of leukoplakia, a simple thickening of mucous membrane, characteristically whitish, smooth or papillary, and may appear as a small spot or diffuse patch. The consistency and color may vary from a thin bluish white to a thick, leathery, ridged and warty yellow-white.

It occurs in response to one or more forms of chronic irritation, such as syphilis, tobacco, chronic sepsis, and avitaminosis, which are also factors in the etiology of cancer.

Leukoplakia is considered a precancerous lesion and its presence should alert the dentist to the possibility of malignant transformation.

Dental factors that may play a carcinogenic role are sharp, carious, and chipped teeth, ill-fitting crowns, fillings, dentures, and oral sepsis. It is even thought by some that galvanism, possibly due to the presence of dissimilar metals like gold and silver, might be an etiologic factor. This, however, seems highly improbable.

As for the presence of dental disorders, like caries, sharp or broken teeth or periodontoclasia – these are seldom considered factors in the production of chronic irritation and eventual mouth cancer. As a matter of fact, in the Head and Neck Clinic at the Memorial Hospital, New York City, Doctor Martin reports that more than one half of the patients who have reached the age of sixty are completely edentulous.

Regarding the belief that ill-fitting dentures are a cause of mouth cancer, it is significant that in a large majority of such cases the lesion is found to be situated in adjacent sites but not in direct contact with the restoration. On the other hand, it is enirely possible that the growing malignancy is contributing to the poor fit of a previously well-adapted denture.

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by Maurice J. Teitelbaum, D.D.S.

Calling Doctor Freud!

It was inevitable. Just like the comic book, television, and the bill collector, psychiatry has finally showed up in the dental office. However, there's no reason for the dentist to run right out and buy a couch – he can just tilt back his chair, draw the blinds, and get the same results. At least that's what a certain dentist in St. Louis, Missouri, says. Dentists are supposed to be artists, pathologists, bacteriologists, sculptors, mechanics, economists, hypnotists, anesthetists, ceramists, photographers, and golfers. And now, according to the St. Louis dentist, "Dentists should equip themselves with the rudimentary knowledge of psychiatry . . . they should be amateur psychiatrists." Some day dentists will be required to be dentists and the release from their other vocations will open up jobs for a couple of hundred thousand other people and prove a boon to the economic well-being of the country. But let's take a look into the office of a Freudian dentist who is greeting the arrival of a new patient:

DR. CY KOSIS: Hello!

PATIENT: Good day, doctor.

DENTIST: (to himself) Mmmmm. Now let me see, what did she mean by that? Why is it a good day? (To the patient) Won't you sit down, please. (The patient sits in the dental chair, which is immediately adjusted to a horizontal position, so that she is reclining.) Now just relax and tell me all about your trouble.

PATIENT: It's the lower part of my mouth, doctor; it pains me.

DENTIST: I see, now when did you begin to notice this discomfort?

PATIENT: Yesterday.

DENTIST: Think carefully, did the tooth in that area ever hurt you in the past?

PATIENT: Yes, I suppose it did.

DENTIST: When?

PATIENT: I don't remember.

DENTIST: You're not on trial, Mrs. Blurb. I am just trying to find out the cause of your dental trouble, and you must cooperate.

PATIENT: I'll try, doctor.

DENTIST: Fine. Now think hard, when did that tooth hurt you for the first time?

PATIENT: Yes, I do remember. It was a long time ago. I was just six or seven years of age. Mother and Dad were having a quarrel. I remember it quite well now . . . Father was so enraged that his upper plate fell out, and I remember my tooth hurting when my mother threw some books at my father and –

DENTIST: Aha! Sympathetic pain–a father fixation!

PATIENT:–one of the books hit me in the mouth.

DENTIST: Oh. Well, when did the tooth hurt you next?

PATIENT: Let me see. Yes, I was thirteen years old and I had just come back from my first party date. I remember it clearly because it was the first time a boy had kissed me. And that night I had a terrible toothache.

DENTIST: Quite naturally–self-inflicted punishment –the manifestation of a guilt complex no doubt. Tell me, what happened on that date?

PATIENT: We gorged ourselves at the party, and I had a few popcorn seeds stuck between my teeth. They worked their way under the gum and the pain that night–

DENTIST: Never mind. When did the tooth hurt you next?

PATIENT: Yesterday, I think.

DENTIST: You think? Aren't you sure?

PATIENT: Well–I just can't remember.

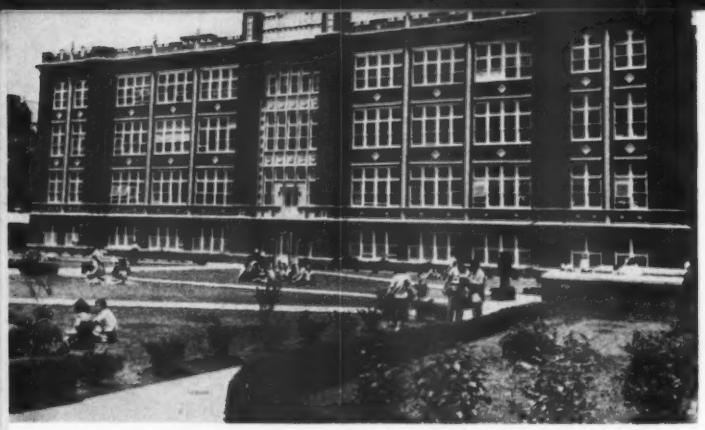
DENTIST: I'm afraid, Mrs. Blurb, that you're holding back something. Suppose I give you another appointment and perhaps next time we can go into your early childhood and carefully get to the bottom of your dental difficulty.

PATIENT: All right, doctor. (Then, taking out her lower full denture) In the meantime, could you trim this plate down a trifle on the left side?–that's where it's cutting me and I have pain.

WINNING TEAM

The occulists are pleasant guys,
But *our* boys get the laurel wreath:
Whenever someone smiles or tries
To smile, he puckers up his eyes
But flashes all his well-groomed teeth.

Frank M. Arouet



The dental school building.

Loyola Univity

Schof

(Photos and te ated Ne

Doctor Harold Peterson of the department of prosthetics inspects a denture before it is placed in a patient's mouth.

The Loyola University School of Dentistry was founded in 1914 as a part of Loyola University at New Orleans. The dental school has expanded consistently over the years until today every department has its own clinical laboratory space.

In 1950 the Edward G. Schlieder Educational Foundation provided a grant which made it possible

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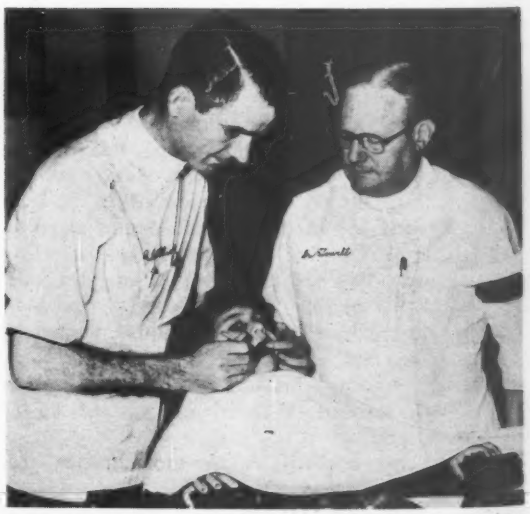
The head of the department of periodontics, Doctor William O. Goggin, supervising the treatment procedure of a student.



Chief of the children's dentistry department, Doctor Robert Towill, right, watches a student examining a child-patient.

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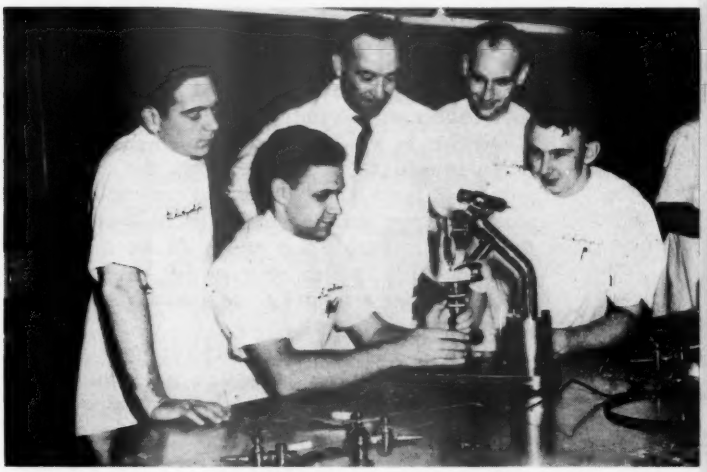
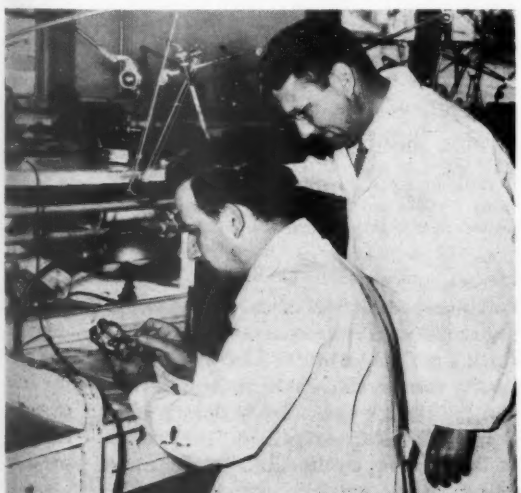
to develop a children's dentistry department, and keen interest has developed in this field.

The records show that 90 percent of the Louisiana students enrolled in dental schools are studying at Loyola. Doctor Frank J. Houghton is the distinguished dean of the dental school.

A view of the busy freshman technique laboratory.



Constructing a partial denture.



The technique laboratory, showing Doctor Robert Eastman, head of the department of operative dentistry, observing a student at work.

The operative dentistry clinic.

Denture Characterization

by Cyril B. Kanterman, D.D.S.

PART 3:

Denture Base Characterization

(Final article in a series)

Until the introduction of the acrylic resins in America in 1937, characterization of the denture base was not possible to the extent it is today due to inherent limitations of the material itself. Since 1855, hard rubber, or vulcanite, had been the best material obtainable as a denture base, and unquestionably it represented a great advance over the continuous gum-tooth porcelain denture and the earlier carved wooden, ivory, and bone dentures of Washington's day. Yet, vulcanite left much to be desired in esthetics. It lacked translucency, life-like color, and other qualities necessary to restore the appearance of the oral soft tissues.

During this period, a number of synthetic resins having a more pleasing initial appearance were tried as denture base materials, but they were invariably subject to warpage, discoloration, or some other undesirable characteristic. Thus, despite its poor esthetic quality, vulcanite remained the denture base material of choice for well over seventy-five years.[1]

To offset this disadvantage, it was the practice to keep the denture base out of sight, and instead, alter the teeth to produce more life-like effects.[2] This procedure was good psychology, for it tended to focus attention to the denture teeth rather than the denture base. Yet, the overall effect was not natural, for most individuals normally display varying amounts of gingival tissue.

The introduction and continued improvement of the acrylic resins have made possible a number of techniques by which the characteristics of the oral tissues may be reproduced with fidelity. The following classification indicates the variety of ways by which the denture base may be characterized:

Classification of Types of Denture Base Characterization

REPRODUCTION OF ANATOMIC FEATURES

- Rugae and incisive papilla
- Festoons
- Vascular appearance of labiobuccal tissues
- Gingival recession

SELECTION OF DENTURE BASE COLOR

- Color matching with tissue
- Mottling

DENTURE SURFACE FINISH

- Non-glaze surface
- Stippled surface

Reproduction of Anatomic Features

An important characterization procedure for the denture base is the reproduction of a natural palatal tissue surface, particularly the reproduction of the patient's rugae formation. There are several reasons why this is indicated.

The rugae are irregularly shaped rolls of soft tissue which together with the incisive papilla comprise the most prominent anatomic feature of the anterior portion of the palate. The rugae contribute to phonetics, assisting in the formation of sounds such as the letter "S".[3] They also play no small part in mastication, providing a washboard surface over which the softer food particles are pressed out by the tongue and mixed with saliva.

Finally, there is a psychological benefit derived when the rugae are reproduced on the denture. The patient experiences more confidence and does not feel quite so alien to his denture when his tongue contacts familiar tissue conformation.

Rugae and incisive papilla may be reproduced on the acrylic denture by using stock rugae forms, but by duplicating the patient's own rugae on his denture the prosthesis is personalized in a real sense. Doctor R. O. Schlosser gives a technique by which this may be easily accomplished.[4] A piece of 0.003 inch tin foil is burnished over the palatal surface of the master model. The depressions on the tissue side of the foil is filled in with molten wax, and this is fused in position on the waxed-up case prior to flasking.

(Editor's Note: Alternately, a plastic wafer can be formed using a slight modification of the Tru-Rugae technique employed in fabricating horseshoe and full palate castings.)

Tru-Rugae

The reproduction of rugae and other palatal tissue detail is no less important for the partial denture casting as it is for the full acrylic denture, although poorly contoured palatal surfaces have been the rule rather than the exception in denture service over the years.[5] Tru-Rugae represents the original technique of duplicating tissue detail on the upper partial or full palate casting in chrome-cobalt alloy. Not only is the rugae area of the palate reproduced in the Tru-Rugae technique, but also the natural surface

in the bicuspid and molar area as well. This surface is especially important in phonetics, since all sounds start from the throat and pass over that area of the tongue in contact with the palate.

Despite the fact that the minute irregularities of the palatal surface are faithfully reproduced on the Tru-Rugae denture, the denture surface is hygienic. The electro-polishing process places a smooth finish on the denture surface, yet all of the fine tissue detail is retained.

Festoons

Prefabricated contour forms may be used to produce anatomic carvings on the labial and buccal surfaces of full dentures, or the festoons may be carved in the wax or in the acrylic.

Festooning is usually routine for most full denture cases. When the contours of the gingival tissues overlying the root portions of the teeth are reproduced, the proper contrast of light and shadow is developed, thus minimizing the reflection of high lights on the polished denture. Simply placing more-or-less uniform and definite grooves in the interproximal spaces is not true festooning. Rather, festooning should be irregular, moderate, and suggestive of the shapes of the roots. If pre-extraction models are available, they will be helpful as guides for the carving of the festoons.

Although festooning may be done with an acrylic bur after the denture is processed, it is easier to do the carving in the wax. To preserve the contours of the festoons in the wax, the case should be tin-foiled with 0.001 inch tin foil prior to investing.

Reproduction of Tissue Vascularity

A newer development in denture base characterization is the incorporation of red fibers in the denture base material to reproduce the appearance of blood vessels in healthy gingival tissues. The result is strikingly realistic when this technique is properly done. It is possible to select from various shades of fibers to harmonize with the shade of denture base acrylic selected.

Alveolar and gingival recession is a condition not infrequently seen in the middle-aged and elderly individual, and occasionally in the younger patient. Duplicating loss of interproximal tissue is an effective way to mask the artificiality of a denture, providing that such a condition was present prior to extraction.

The dentist must keep two points in mind when he characterizes a denture in this manner. First, the glaze on the exposed root portions of the artificial teeth must be removed, as glazed roots are not natural. Secondly, because the unfilled interproximal spaces are food traps, the patient must exercise special care to keep his denture hygienic. Thus, this type of characterization is not indicated for the individual who tends to be lax in matters of oral hygiene.

Denture Base Color

Because the denture base is the least conspicuous part of the denture, dentists usually do not consider color selection of the denture base material. Consequently, no particular shade of acrylic is specified, and an arbitrary pink color is generally used. However, one can make the denture more esthetically pleasing by selecting the shade of acrylic most closely approaching that of the patient's oral tissues. It is true that there is not as wide a selection of denture base shades from which to choose, so that the acrylic shade cannot be matched with the same degree of accuracy as with tooth shades. Yet, the denture will be more appreciated by the patient when an attempt is made to duplicate the color of his tissues.

The dentist who desires to match the coloration of the patient's tissues to an even greater degree may do so by altering the color of stock acrylic shades. This is accomplished by the mixing of inorganic mineral pigments with standard denture base shades. For example, red spanish oxide, which is a brownish red pigment, will produce a more life-like color when added in small amount to regular pink acrylic colors. Mercuric sulfide, a vermilion pigment which produces a bright red in combination with pink plastic, may be used to reproduce red arteriole lines.[6] Various other pigments may be mixed to produce different effects that stimulate natural tissue color.

To further enhance the natural appearance of the denture base, consideration should be given to color variations in the same mouth as well as the general coloring of the tissues. The shade and color of the oral mucosa often varies from one area to another, so that there is seldom a uniform color throughout. By the use of appropriate stains and various shades of denture base acrylic, it is possible to reproduce the mottled effect of the tissues.

To carry out this type of characterization best, the mouth should be studied preoperatively, as many of the color markings are lost after the teeth are extracted. Doctor V. G. Rich points out that the object is to duplicate the coloring of the normal and healthy dentition rather than the coloring of the edentulous mouth.[7] A sketch indicating the location and extent of color markings of the mucosa is a pre-extraction record that will be of value in reproducing the tissue mottling.

Denture Surface Finish

The type of finish on the acrylic denture surface is an important factor in producing a more esthetic

appliance. A highly polished, lustrous finish is routinely placed on most dentures, because it is felt that such a finish is the most hygienic. Examined outside of the mouth, a denture with a glossy, light-reflecting surface looks attractive. In the mouth, however, such a denture bespeaks of artificiality and is esthetically displeasing. A surface which has been carefully pumiced with rag wheels and felt cones is just as hygienic as the polished one, and considerably more esthetic.

There are other reasons why the highly polished acrylic surface should be avoided, particularly on the palatal surface of an upper denture. There is evidence that the non-glossy surface is better tolerated by the patient. Doctor L. G. Jordan [8] states that the palatal surface of a denture should be one of frictional resistance, rather than smooth and highly polished. He reports a case in which nausea in a non-gagger disappeared after the high polish was removed from the palatal surface of an acrylic denture. Phonetics is also improved because the tongue, an important instrument in the production of sounds, is able to obtain a degree of traction on the denture surface, similar to that when the tongue is rubbed against the palatal mucosa.

As previously indicated, a surface of frictional resistance is also desirable for metallic palatal areas. Such a surface, as exemplified in the Tru-Rugae denture, enables the tongue to function in a more natural manner during speech, mastication, and deglutition.

Stippling is the process of producing many fine indentations on the labio-buccal surface of a plastic denture in order to eliminate the glare and reflection characteristic of polished acrylic. This can be done either in the wax with a stiff bristle brush, or in the processed denture using a straight handpiece round bur bent slightly off-center. Some may object to the stippled surface on the grounds that it is less hygienic than the smoothly finished surface. While this may be true of the denture wearer who is lax in habits of oral hygience, with average care the stippled denture may be kept as clean as the smooth type.

Although the dentist may feel that the primary function of the denture is to restore the patient's ability to masticate food properly and, in the case of the partial denture, to preserve the remaining teeth, many patients seek prosthetic service primarily for cosmetic reasons. The dentist would do well to keep this in mind, for although a denture can be successful from a functional standpoint, it may be a failure in the eyes of the patient due to esthetic shortcomings, real or imagined.

The patient will invariably derive more satisfaction from a personalized denture, so such service should be rendered where it is indicated. In doing so, however, the dentist should remember that the denture will serve as a perpetual advertisement of his professional skill. Thus, characterization should never be carried beyond the limits of good taste, nor should it be done at the expense of masticatory efficiency.

[1] Sweeney, W. T., Paffenbarger, G. C., and Beall, J. R., "Acrylic Resins for Dentures," *Journal of the American Dental Association, 29*:7 (Jan.) 1942.

[2] Pryor, W. J., "Methods of Producing More Life-Like Dentures, including the Preparation and Processing of Acrylic Dentures," *Journal of the American Dental Association, 28*:896 (June) 1941.

[3] Swenson, M. G., *Complete Dentures*, 3rd ed., C. V. Mosby, St. Louis: 1953.

[4] Schlosser, R. O., *Complete Denture Prosthesis*, 2nd ed., W. B. Saunders, Philadelphia: 1947.

[5] Walker, T. J., and Orsinger, W. O., "Palate Reproduction by the Hydrocolloid-Resin Method," *Journal of Prosthetic Dentistry, 4*:54 (Jan.) 1954.

[6] Rich, V. G., "Natural Gingival Colors," *Journal of the American Dental Association, 33*:646 (May) 1946.

[7] *Idem.* p. 645

[8] Jordan, L. G., "Are Prominent Rugae and Glossy Tongue Surfaces on Artificial Dentures to be Desired?" *Journal of Prosthetic Dentistry, 4*:52 (Jan.) 1954.

The Constant Plane

(*Continued from Page Four*)

tures are again occluded and returned to the mouth. Inside calipers are used to measure the distance from the papilla to the mandibular ridgecrest for the record.

The Fourth Category

Full denture cases in the fourth category are the most baffling and usually present without dentures, casts or any record of original dimensions. The approach to these cases is direct. Assuming the ridges to be normal, the tragus ala line is used without fail. The maxillary compound occlusal rim is contoured and marked 1 mm. above the upper lip line in repose and paralleled with the tragus ala line on the face. It is carefully equalized and notched for the reception of the mandibular occlusion rim which had been marked 1 mm. below the lower lip line in repose. With this mark established, the occlusal rim is heated and closed to it. Though wanting the merit of exactness, it is better than hazarding a guess.

No one who is acquainted with the present tone of thought as it pertains to prosthodontics can hide from himself that a change is impending, and more particularly as it relates to the recovery of the correct elevation of the occlusal plane and the correct height of the "bite" when disease has destroyed the normal conditions.

Dental Wives:

Beginning Again

by Kay Lipke

In nearly all families—dental or otherwise—there is one particular time of year when life seems to start over again. A reviving gust of energy sweeps through the minds of husband and wife, electrifying the whole atmosphere. It is then that new ideas spring into being, new decisions are put into operation.

For most people this time seems to be the first of January, after the Christmas holidays. In our family, the time is April.

April is a good month to "begin again." All about us nature is busy shedding the drab raiment of winter and is bursting into bud and bloom. The air is clear as the finest crystal. Minds partake of that clarity as well. In the world of fashion, April is set aside for an annual transformation in clothing. In religion it is an inspiring time of uplift and rebirth.

And in dentistry? Well, April seems to be a time of rebirth for dentists and their families also. Behind are the grim months of the year when patients forego needed dental work because of holiday expense and activities, and the bills seem to come in much faster than the checks.

All that gloomy business is left behind by April, and ahead lie the good months of the year.

In our dental family, we have an annual date to go away by ourselves for a few days in April. The dentist takes care of all the students and school teachers who crowd the office during Easter vacation, and the minute Easter Sunday has passed, we turn our backs on dentistry and home problems, on national and international crises, and leave the tensions of the world behind us for a few days.

It is our time of "beginning again." We climb into our car and drive out to some pleasant quiet hot springs curled with its back against a Southern California hillside, and an orange grove in full heady bloom spread out at its feet, and for three or four days we do nothing. We really get acquainted with each other all over again during these special April days. We laugh a lot, take long walks, loll in the warm sulphur pool, and read light, silly magazines. The serious dental literature is left at home together with all the books I feel I should read to keep up with others. We suddenly see life in its true perspective—and each other as we really are. We are much nicer people than usual.

Then one morning, after a whopping big breakfast and a few good-bys, we climb into our gaudy little sports car and start out for home. To our surprise, we find ourselves anxious to get back to our individual jobs. The dentist talks eagerly of plans for rejuvenating his office, and putting new and stimulating ideas into operation. He is on fire with enthusiasm. I have a plan or two of my own.

Those few days have worked a small miracle in our lives. The years have been peeled from our bodies, and fatigue and inertia have vanished from our minds. We are ready to go once again.

And a very good thing! Ahead of us is a national presidential election, with all its extra worries and tensions. The dentist is going to have to cope with endless political discussions by patients in his office, meanwhile keeping his own very decided political ideas to himself. It is a rule of his office that neither politics nor religion is to be discussed there, but during a national election summer it is almost impossible to sidetrack a patient who is burning with political fervor.

Many a fifteen minutes will be utterly wasted while the dentist waits with instrument in hand, ready for the dental operation, until the patient in the chair finishes airing his views. And many a night he will come home with spirit dragging and nerves crawling up his back after a "political day" at the office.

So, during April we will store up energy for the months ahead. For us no headlines and serious cumbersome thoughts. The big news will be the hillsides covered with wild flowers, the new humming birds' nest outside our window, and how soon will the dinner bell ring. A spring holiday is wonderful therapy.

We will be back in the world of dentistry and politics before the end of the month. In the meantime, Happy April to you!

"COULD HE WORK ON ME RIGHT AWAY BEFORE I THAW OUT?"

Doctor Walter J. Pelton

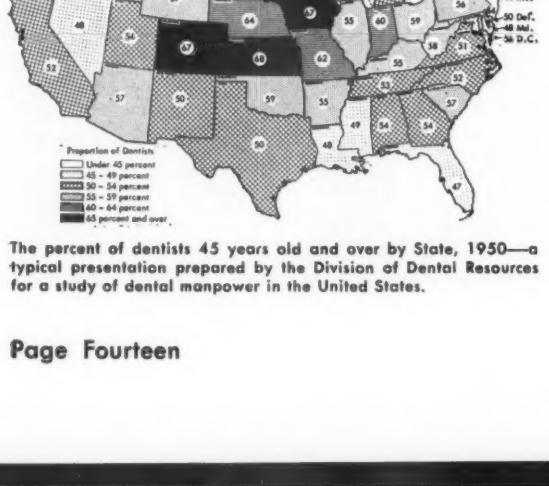
R FOR LIVING

Public Health Service Dentist

by Joseph George Strack

Part 3 of a series

"Every dentist, dental hygienist, and dental assistant will be interested in the work of our Division of Dental Resources," Doctor John W. Knutson, Assistant Surgeon General and Chief Dental Officer of the U. S. Public Health Service, says, explaining: "This division makes studies of ways and means of making better use of existing dental personnel, developing time-saving methods, and otherwise increasing productiveness and efficiency in the practice of dentistry. Recent projects of the twenty staff members of this unit included studies of educational resources for dentistry and dental hygiene, methods of increasing the dentist's productivity through the use of multiple chairs and more assistants, techniques of determining the efficiency of specific dental operations, and developing devices for better recording of dental services and needs."



The percent of dentists 45 years old and over by State, 1950—a typical presentation prepared by the Division of Dental Resources for a study of dental manpower in the United States.

Pointing out that the Division was set up in September 1949, Doctor Knutson says: "Within the few years it has been in existence, this unit has made a wide variety of first-rate contributions in the dental field, contributions that all of us in dentistry are proud of."

Accomplishments

Doctor Walter J. Pelton, Chief of the Division of Dental Resources, Bureau of Medical Services, United States Public Health Service, lists some of these achievements as follows:

(1) In 1950, the Division in cooperation with the Council on Dental Education of the American Dental Association and the American Association of Dental Schools, planned a study of the financial status, faculty patterns, present facilities, and estimated needs for additional facilities in dental and dental hygiene schools in the United States. The PHS's Division of Public Health Methods, which had also conducted a similar study of medical schools, was credited in the report issued in 1952 entitled, *Financial Status and Needs of Dental Schools,*

PHS Publication No. 200. From this developed much interest in the students' financial status. (See Current Projects, end of this article.)

(2) Procedures to augment the efficiency of the clinical dental operator through the use of chairside assistants and improved equipment or procedures have been tried in PHS hospitals. Associated with these efforts have been (1) the development and manufacture of an improved dental instrument cabinet (W. D. Allison Company, 1133 Burdsal Parkway, Indianapolis, Indiana), (2) the independent establishment of special projects in at least three dental schools to teach dental students the proper use of auxiliary aids for extending dentists' effectiveness to the public, (*Annual Report PHS 1950*, p. 28 and *1951*, p. 29) and (3) experimentation with six radiographic films (instead of the usual eleven or fourteen films customarily used for oral diagnostic purposes). The conclusion reached was that, although the six-film series does not provide sufficient coverage to be useful in clinical practice, the method might be adaptable to mass screening programs or as a relatively inexpensive routine procedure for patients admitted to hospitals for other than dental reasons. (*Military Medicine*, 116:446-450, 1955)

Doctor Pelton says of the new cabinet: "Its chief assets are automatic drawers that open and close without the use of unhygienic drawer-pull knobs; a dust-proof interior; and instrument trays and bottle holders of modified design which can readily be cleaned."

(3) The proper construction of dental operatories utilizing gases for general anesthesia was investigated and a paper was prepared, "The Dentist and the Explosion Hazard." (*J. Oral Surgery*, 11:26-33, 1953.)

(4) To facilitate planning for dental care and to catalogue specific types of non-federal dental facilities, *Directory of Dental Clinics in the United States –1954* was prepared. (Mimeographed by Division of Dental Resources, PHS.)

(5) From time to time information relative to dentists and their distribution in the United States has been furnished to other governmental units, committees, and commissions. At the request of the Oklahoma State Dental Association and the Oklahome State Health Department, an investigation of the present dental manpower, population, and economic status was made. Estimates were supplied as to the probable future population-dentist ratio, economic status of the State, and changes that might be expected to influence the problem. Recommendations relative to the State's need for dental training and dental-hygiene training facilities are incorporated in the study, *A Study of Oklahoma's Dental Manpower Requirements* (published for limited distribution in November 1954). Participation of the American Dental Association in this instance and the W. K. Kellogg Foundation's interest in the general area have led to further studies of this nature. (See Current Projects.)

Recent publications of the Division of Dental Resources—vital contributions to dental literature.

(6) In attempting to estimate the number of dentists required for adequate management of individuals with dentofacial deformities, a statistical tool needed to apply epidemiologic methods to the problem. Efforts to develop such a tool for determining the incidence and prevalence of dentofacial deformities in large populations has led to a series of four papers under the general title of "Studies of Dentofacial Morphology" (*Angle Orthodontist*, 21:163-171, 1951; *Am. J. Orthod.*, 39:193-200, 1953; *JADA*, 46:648-657, *Angle Orthodontist*, 25:199-207, 1955.)

(7) Using data obtained while at the Cleft Palate Center and the Departments of Otolaryngology and Radiology, University of Illinois, one of the staff prepared a report entitled "The Significance of Adenoid Tissue in Orthodontia," published in the *Angle Orthodontist*, 24:59-69, 1954.

(8) To assess the dental problem of adults and to estimate the requirements which must be met in planning for dental care programs, an investigation was made of the tooth morbidity experience of adults as revealed by nearly a quarter-million dental examinations made during the routine care of certain PHS beneficiaries. The cumulative effect of dental disease with advancing age was interpreted in an article, "Tooth Morbidity Experience of Adults" (*JADA*, 49:439-445, 1954).

(9) A technical development for the statistical management of mass data which simplifies and

speeds recording and tabulating by mechanical means resulted in the publication of "A Mark Sense Card for Recording Dental Examination Findings" (*J. Dent. Research* 31:113-118, 1952). The Division has continued to use the mark sense cards in various studies and plans to attempt further adaptations for them in connecion with studies on prepayment for dental care.

(10) The Division's initial effort to obtain specific actuarial data useful in planning for the distribution of dental care through the application of insurance principles resulted in PHS Publication No. 395, *Comprehensive Dental Care in a Group Practice.* This is a cooperative project with Group Health Association, Inc., Washington, D.C., and presents an analysis of specific services provided and the time required to render those services. While this research was a substantial contribution, it indicated that a great deal of additional information is needed concerning the costs for specific dental services under the prepayment principle as well as the variations in patient utilization of such services. To test whether or not dental treatment can successfully be included in prepayment programs, data from the above study have been subjected to further analysis. A report, entitled *The Predictability of Dental Care Needs of Adults,* will soon be published. A third paper, *Planning a Dental Prepayment Program for Children in an Area of Low Caries Prevalence,* also to be published in the near future, attempts to arrive at premium rates feasible for a prepayment plan carried out in the offices of private practitioners.

(11) The Division, in cooperation with the Division of Public Health Methods, developed data concerning the training and distribution of dentists which was published as the seventh in the series of *Health Manpower Source Books* (PHS Publication No. 263, Section 7).

Current Projects

Three projects under way or completed at this writing include the following:

1. DENTAL NEEDS AND RESOURCES OF THE ELEVEN WESTERN STATES: A study being made at the request of the Western Interstate Commission for Higher Education, with the cooperation of the Council on Dental Education, American Dental Association, and the W. K. Kellogg Foundation.

2. COST OF DENTAL STUDENTS' AND DENTAL HYGIENE STUDENTS' PROFESSIONAL EDUCATION: a survey being done in cooperation with the American Dental Association and the several dental schools.

3. INVENTORY OF DENTAL HYGIENISTS, THEIR NUMBER, DISTRIBUTION AND LENGTH OF STAY IN LABOR MARKET: being compiled at the request of, and in cooperation with, the American Dental Hygienists Association.

Everyone in dentistry has a professional stake in the plans, performance, and achievements of the Division of Dental Resources. Consequently, dentists, dental hygienists, and dental assistants especially—not to mention the manufacturers of dental equipment and supplies—should keep abreast of the Division's projects—projects that are practical and profitable.

NEXT MONTH—PART IV

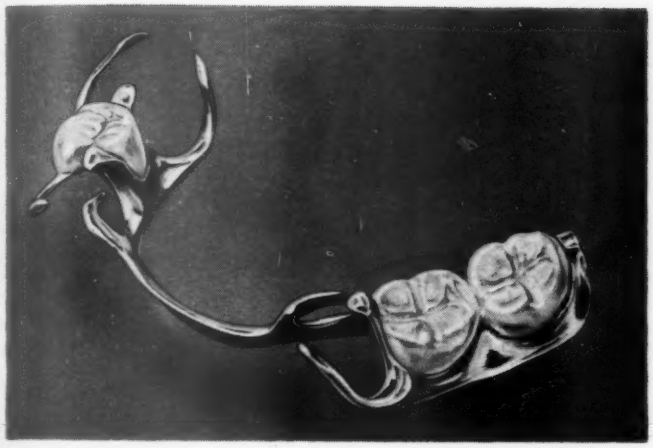
BRIEF BIOGRAPHY OF A DENTAL LEADER

Dental Director Walter J. Pelton was born in Cleveland, Ohio, obtained a B.S. degree from Western Reserve University in 1929 and a D.D.S., in 1931. After an internship at the Cleveland Marine Hospital he was commissioned in the U. S. Public Health Service in 1932. Following duty in Public Health Service hospitals in Seattle and New York and two Coast Guard assignments in Alaska, Doctor Pelton returned to the Graduate School at the University of Michigan, where he obtained a master's degree in public health in 1939.

Except for two years during World War II, when he served at the U. S. Public Health Service Hospital, Manhattan Beach, New York, Doctor Pelton has devoted his time to the promotion of dentistry for children, to public health work, and to field studies relating to dental caries and dentofacial deformities. Since 1951 he has been Chief of the Division of Dental Resources of the PHS Bureau of Medical Services. He is a Fellow of the American College of Dentists and of the American Public Health Association; a member of the American Association of Public Health Dentists, on whose executive committee he formerly served, and a member of the American Society of Dentistry for Children. He was the first Secretary and later Chairman of the Dental Health Association a few years ago. Doctor Pelton is a diplomate of the American Board of Pedodontics, as well as founder and first President of the American Board of Dental Public Health. He is a co-editor, with Doctor J. M. Wisan, of the definitive text, *Dentistry in Public Health,* now in its second edition.

His fraternities include Delta Upsilon, Delta Sigma Delta, Omicron Kappa Upsilon, and Delta Omega (PH Honorary).

He lives at River Road, Route 1, Rockville, Maryland.



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